



In 1998, People's Army guards from North Korea march in formation to their appointed posts during a repatriation ceremony in the Panmunjom Joint Security Area. (U.S. Air Force/ James Mossman)

# North Korea's CBW Program

## How to Contend with Imperfectly Understood Capabilities

By John Parachini

Any major conflict on the Korean Peninsula would put thousands of lives at risk even if it were well short of a nuclear exchange. The conventional forces aligned along the 38<sup>th</sup> parallel, the border between North and South Korea, are formidable. If a conflict were to erupt short of a nuclear exchange, many fear North Korea might use chemical or biological weapons (CBW). While there is some confidence in the assessments of North Korea's chemical weapons capabilities, comparatively little is known about its biological weapons capabilities. Lack of knowledge about North Korea's biological weapons capabilities is not unique. Aside from the United States, the former Soviet Union, South Africa, and Iraq—countries that have disclosed the nature of their past biological weapons programs—comparatively little is known about other state biological weapons programs.

Biological weapons programs tend to be among the most closely guarded weapons programs in a country's arsenal. By contrast, extensive documentation and histories of nuclear weapons programs exist for virtually all the known weapons states as well as those that abandoned such programs. In recent years, while North Korea (formally the Democratic People's Republic of Korea or DPRK) has gone to great lengths to demonstrate to the world its nuclear and missile programs, the country has hidden whatever CBW it may possess. As the international community grapples with how to reduce tension on the Peninsula, re-assessing what is known about North Korea's CBW program and considering options to minimize their role in the regime's security calculus is an important addition to the complex set of issues that U.S. civilian and military leaders must consider. This article attempts to put in context what little is known about North Korea's capabilities and offer some measures that might be taken to help curtail those capabilities.

### Avoiding the "Iraq Moment" in North Korea

There are some parallels with what we knew about Iraq's weapons of mass destruction (WMD) program before 2003. In the Iraq case, the United States knew a good deal about past efforts, but not much about the status of the program at the start of the 2003 military operation. Former Iraq President Saddam Hussein's reluctance to openly disclose the abandonment of his WMD programs for fear of appearing weak to his own

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Mr. John V. Parachini is a senior international policy analyst and director of the Cyber and Intelligence Policy Center at the RAND Corporation. This article draws from his testimony before the U.S. Congress in January that was last updated in early March.

people, or historical enemies such as Iran or the United States, confused assessments of Iraq's capabilities. Pretending to have capabilities he did not was hard to imagine.

In the case of North Korea, we know very little about either past or present CBW programs, plans, or intentions. The regime's nuclear and missile programs would appear to provide a credible deterrent against an external military threat. It is certainly possible, however, that the technical sophistication necessary to develop a nuclear capability, has been applied to CBW for the contingency of a non-nuclear fight. Chemical and biological weapons do not require as much industrial infrastructure or unique materials as nuclear weapons programs. The conundrum facing U.S. policymakers and military leaders is that they cannot wait until the "enemy is at the gate," the evidence is incontrovertible, and they are facing disaster before taking action. Conversely, hasty action can lead to a different form of disaster.

While it is important not to let attention to North Korea's nuclear weapons obscure the potential dangers CBW capabilities may pose, it is equally important not to overstate those dangers. Doing so might create an Iraq-like moment where feared capabilities catalyze preemptive military action that turns out to be mistaken. In one of the most heavily armed regions of the world, miscalculating the threat, either by over or underestimating it, can divert precious resources and leadership time in unproductive, or even destructive directions. As the Iraq case illustrates, such a miscalculation can have unanticipated consequences and enduring costs long past the initial operational objective. Prioritizing among the threats posed by different weapons categories poses is essential and, in the case of the highly secretive DPRK, inherently difficult. The nuclear weapons threat is certainly our greatest concern, but in light of the recent heightened tension on the Peninsula, calibrating how CBW and conventional weapons factor into

the military standoff is more important than it has been since the end of the Korean War.

Given the horrific effects these weapons capabilities might cause, even a modest capability must be taken seriously. Information sources, some of which are indirect and difficult to validate, have been diverse and inconsistent. Additionally, North Korean skill at denial and deception further complicates any assessment of actual capabilities. Nevertheless, estimating the threat of North Korean CBW capabilities is important for determining the appropriate use of U.S. and allied resources. It is important to hedge against even low-probability threats if they have high consequences. On the Peninsula, where any military confrontation risks escalating to the nuclear precipice, U.S. and international community efforts should aim to reduce the likelihood of CBW usage because of the potential for escalation to cross the nuclear threshold, as well as the mass death CBW would cause by themselves. This danger has become more acute as the United States Nuclear Posture Review states that the United States retains the option of responding to non-nuclear threats with nuclear weapons.<sup>1</sup> Depending upon the context, any of North Korea's non-nuclear military capabilities might trigger a nuclear retaliatory attack.

### **A Credible Threat That is Easy to Produce**

Since North Korea's chemical and biological programs are smaller and easier to embed in legitimate industrial production facilities they will be significantly harder to detect. Unlike nuclear tests, which generate seismic signatures, and missile launches, which can be detected via a variety of technical collection methods, CBW can be produced with some of the same production capabilities used for producing paint, pesticides, and pharmaceuticals.

There is some consensus that North Korea initiated work on chemical weapons in the 1960s

and began producing them in volume in the early 1970s.<sup>2</sup> Most estimates indicate that DPRK's chemical weapon arsenal contains nerve agents, blister agents, blood agents, choking agents, and riot-control agents. Their stockpile of chemical weapons is estimated to range from 2,500 to 5,000 tons.<sup>3</sup> This figure has not changed in more than a decade, which raises questions about its accuracy. Delivery methods are believed to include artillery projectiles, various types of rockets, aircraft, ballistic missiles, drones, and naval weapons systems.<sup>4</sup> The same numbers are repeated in several scholarly articles thereafter without change, again raising the question of accuracy. It is possible that the regime produced and weaponized this quantity of chemical agent at one point and never modernized further. If this is the case the quality of the chemical agent may have degraded. Alternatively, the regime may have continued to modernize its chemical weapons arsenal, in which case these tonnage figures are too low. Early assessments questioned whether the tonnage figures referred to weaponized agent or agent stored in bulk containers.<sup>5</sup> This underscores the number of unknowns even about a weapons capability that most analysts believe exists.

Some analysts believe that North Korea would use its chemical weapons to gain a quick strike advantage in the early stage of a ground conflict or as a retaliatory measure if the regime were on the verge of defeat.<sup>6</sup> They suggest North Korea would use chemical weapons to degrade South Korean and U.S. ground operations and to terrorize the civilian population in South Korea. Depending upon the intensity of the conflict, North Korea might also launch ballistic missiles with chemical payloads against U.S. air bases in the region to suppress U.S. air support to combat operations on the Peninsula. These are two among several plausible scenarios against which U.S. and allied planners must hedge, despite their uncertainty.

The recent murder of Kim Jong-Un's half-brother, Kim Jong Nam, with some form of VX nerve agent in Malaysia's Kuala Lumpur airport offers some insight into the Kim regime's willingness to use chemical weapons.<sup>7</sup> Assassinations can be carried out through a variety of means, and other countries have assassinated people with chemicals and toxins.<sup>8</sup> However, the context of this particular incident suggests the possibility that the means was selected not just for its lethal power: assassinating a regime adversary in such a public place with a chemical warfare agent may have been intended to send a message to the international community about the regime's chemical weapons arsenal and its willingness to use it.

### Much to Fear, but Not Much Evidence

Our information sources are inconsistent, often outdated, and generally insufficient. What other factors might explain why we know so little about North Korean biological weapons capabilities? First, as noted, the regime may be able to hide biological weapon development activities more effectively than its nuclear and missile activities because of the significantly smaller required infrastructure and their dual-use nature. Efforts to develop biological weapons can be undertaken in facilities smaller than the industrial facilities required to produce chemical warfare agents, let alone nuclear weapons. Second, the regime may have never pursued a biological weapons capability to the same extent as other capabilities due to the inherent challenges of effective program management. Though DPRK joined the Biological Weapons Convention by accession in 1987, its dubious record of compliance (or non-compliance) with international accords is not reassuring. Third, international experience of state biological weapons programs suggests they take considerable time, resources, and expertise to achieve even rudimentary levels of capability. Fourth, the regime may have dedicated more resources to other components



In 2012, U.S. Secretary of Defense Ashton Carter tours the Military Armistice Commission Building in Panmunjom, South Korea in the demilitarized zone separating North and South Korea. (U.S. Navy/ Chad McNeeley)

of its military that showed potential for quicker and easier progress. Finally, the regime may only have defensive capabilities because it relies upon its nuclear capability for survival and does not view biological weapons as an effective deterrent.

In a 2012 white paper, the South Korean Ministry of National Defense (MND), assessed that North Korea “likely has the capability to produce a variety of biological weapons including anthrax, smallpox, plague, tularemia, and hemorrhagic fever virus,” but provided no supportive documentation or evidence.<sup>9</sup> In 2016, the MND slightly altered the language to “sources indicate that North Korea is capable of cultivating and producing various types

of biological agents such as anthrax, smallpox, and plague on its own.”<sup>10</sup> Frankly, the same could be said for many other countries with industrial infrastructure similar to that of North Korea. The distinction, however, is the context of North Korea’s aggressive actions, frequent non-compliance with international agreements, and flagrant disregard for international norms.

The evidence of a DPRK biological program is comparable to that for North Korea’s nuclear, missile, and chemical, weapons programs. Defector reporting presents the most worrisome picture of the North Korean biological weapons program, but many of these reports are based on indirect or secondhand

knowledge, repeat what has appeared in the open press, or are evidently inaccurate.<sup>11</sup> During 2003–04 and again in 2009, several defectors claimed that North Korea tested biological agents on political prisoners.<sup>12</sup> Given how the regime has brutalized its people and inflicted violence on opponents, these reports are plausible albeit difficult to verify.

Several independent analysts and assessments by the government of South Korea estimate that North Korea has a dozen biological agents. If true, this is more BW agents than either the United States or the former Soviet Union produced in their BW programs.<sup>13</sup> There are reports that recent defectors have been vaccinated for anthrax, which has led to assertions that the regime has anthrax in its arsenal and is prepared to use it.<sup>14</sup> We cannot rule out the possibility, however, such vaccinations might be a routine practice of North Korea's defensive program. North Korea has argued for years that the United States attacked it with BW during the Korean War and fears the United States might again attack with BW. There is no credible evidence to substantiate North Korea's claim or its current fear.

As evidence of U.S. preparations to conduct a BW attack, North Korea cites the U.S. military's public acknowledgement that in 2015 it advertently sent live anthrax cultures to labs in the United States and to an American military base in South Korea.<sup>15</sup> Shortly after the mishap, Kim Jong-Un visited Pyongyang Bio-technical Institute, a pesticide plant that could be a cover for a BW production facility.<sup>16</sup> Images of the visit did not reveal the military security typical of known or suspected clandestine BW programs throughout history, nor did the images provide compelling evidence that the Institute was a BW facility cleaned up for show. The images did, however, reveal that the regime has obtained equipment that could be used perniciously, raising questions about North Korea's compliance with UN sanctions and underscoring the difficulty of determining the true nature of capabilities that are inherently dual-use.

Recent unclassified U.S. Government threat assessments have shed little if any light on any North Korean biological weapons program; in some instances, these assessments have changed without clear explanation. A threat assessment by the Central Intelligence Agency (CIA) in 1997 indicated that North Korea was "capable of supporting a limited [biological weapons] effort."<sup>17</sup> In 2005, then CIA Director Porter Goss reported that "North Korea has active [chemical weapons] and [biological weapons] programs and probably has chemical and possibly biological weapons ready for use."<sup>18</sup> Since 2014, the U.S. Intelligence Community's unclassified assessments on BW have dropped North Korea from the list of suspect programs. In 2014 Director of National Intelligence (DNI) James Clapper only singled out Syria as having "some elements" of a biological warfare program that had "advanced beyond the research and development stage."<sup>19</sup> One year later, DNI Clapper did not cite any biological weapons programs of concern.<sup>20</sup> Current DNI, Daniel Coats, also failed to mention any biological programs in his first World Wide Threat testimony—an annual requirement—before Congress in May.<sup>21</sup>

What circumstances or conditions might have changed between the earlier and the latest threat assessments? New information might have merited an update to the analytic line. Alternatively, given how the Kim regime shrouds its weapons programs in secrecy, some things might have been misinterpreted that were subsequently clarified. The known program may not be sufficiently significant to highlight. Another possibility is the information the DNI has cannot be revealed in open forums. Thus, while it may be tempting to take comfort in the diminished threat perception of the most recent assessments, there are many factors mitigating against greater confidence. Alas, the international community remains largely, and disconcertingly, in the dark.

## CBW and Nuclear Support for Other State and Non-State Programs

North Korea is known to provide military assistance to demonstrate solidarity with its allies.<sup>22</sup> The regime's collaboration with Iran and Syria on their missile programs, with Hamas and Hezbollah on conventional weapons, with Syria on a nuclear reactor, and allegedly with Syria on chemical weapons development, all combine to heighten international concern that North Korea is willing to proliferate unconventional weapons and capabilities.

North Korean support of Syria's nuclear aspirations is the most extensive and disconcerting example of such proliferation that is in clear violation of the international norm. In the wake of the Israeli bombing of the North Korean-designed and built nuclear reactor, Syrians failed to acknowledge its destruction.<sup>23</sup> Their reluctance to publicly acknowledge the existence of the reactor fostered suspicion that it was intended for a clandestine nuclear program. To dispel any question about the nature of the nuclear reactor former CIA Director Michael Hayden in an op-ed from 2011 said that he told the U.S. President that the al-Kibar reactor North Koreans helped build for Syria "was part of a nuclear weapons program."<sup>24</sup> North Korean and Syrian decade-long cooperation on the reactor is indicative of the extent to which the North Korean regime is willing to violate international norms to support its allies and generate revenue.

There are also reports that North Korea has helped Syria with its CW program.<sup>25</sup> Press reporting indicates that a forthcoming report from a UN Panel of Experts will provide greater detail on North Korean assistance to Syria's chemical weapons capabilities that it only alluded to in a single paragraph on Syria in a 2013 report.<sup>26</sup> According to that report, Syria-bound ships from North Korea were interdicted and seized items included defensive chemical warfare equipment, such as protective clothing and chemical antidotes.<sup>27</sup> Press accounts revealed that

one of the interdictions involved a Libya-flagged ship that was stopped by Turkish authorities while passing through the Dardanelles.<sup>28</sup> There are reports of similar shipments of equipment seized by Greek and South Korean authorities back in 2009.<sup>29</sup>

Although North Korea is known to have provided conventional weapons to Hamas and Hezbollah, either directly or via Iran, as well as tunneling equipment and training, no evidence has yet surfaced that it transferred nuclear, chemical, or biological capabilities to any non-state actors such as Hamas or Hezbollah.<sup>30</sup> The regime appears at least to have respected the international norm prohibiting transference of unconventional weapons to non-state actors.

## Potential Measures to Curtail North Korea's CBW Capabilities

There are no "silver bullet" solutions to the threat that any North Korean CBW capabilities would pose. However, there are measures that may help to limit the desire of the Kim regime to expand its actual or latent CBW programs, to deter and reduce potential effectiveness of those programs against South Korea, and to re-enforce global norms against the production and use of poison, disease, and bacteria as weapons.

## Promote Transparency via Reassurance

A recent proposal designed to decrease North Korea's security concerns, be they real or imagined, may also provide an opportunity to increase transparency regarding its chemical and biological weapons activities. The United States has pressed China to influence North Korea without much success. Tension on the Peninsula is rising to such a level that the international community may need to do more than to urge China to uphold its sanctions commitments and to press the North Korean regime to cease its nuclear and missile tests. The prospect of a meeting between the U.S. President

and North Korea's Supreme leader will hopefully reduce tension, but there is always a risk that tension may rise. If tension escalates to the brink of war, one dramatic and unconventional option to consider to avoid militarily intensive conflict may also provide an opportunity to achieve greater transparency on North Korea's CBW capabilities. Alton Frye, a long-time analyst and adviser to senior U.S. officials, recently suggested that China could station 30,000 troops in North Korea to reassure the regime of its survival.<sup>31</sup> This is the equivalent number of troops the United States has stationed in South Korea as a deterrent against DPRK aggression and to reassure the South Korean Government of the United States' commitment to its security. Another function of the Chinese forces could be to verify the regime's compliance with the Biological Weapons Convention and evaluate the security of its chemical weapons capabilities. This proposal assumes away potential complications such as how North Korea, South Korea, or the United States might not want Chinese troops on DPRK soil. Additionally, the Chinese leadership might not want to be seen as an occupying state. Yet, if the alternative that hangs in the balance is a major war that could escalate to a nuclear exchange, all parties in the regime may welcome a confidence building measure that is hard to imagine now. Interested parties should look for opportunities to suggest transparency measures as bi-products of any initiatives that shift relations on the Korean Peninsula.

### Help South Korea with CB Defenses

Helping South Korea bolster the chemical and biological defenses of its armed forces and civilian population near the DMZ can strengthen deterrence by denial. If the South Korean armed forces have better chemical weapons protective gear, and train more to operate in a battlespace contaminated by chemical warfare agents, North Korea may be less inclined to use chemical weapons. Given the size

of the civilian population this will be difficult to accomplish on a nationwide basis in South Korea, so it should by no means be considered a solution to the threat. However, South Korea might look to Israel as an example of how a state might prepare to mitigate the effects of a possible chemical weapons attack.

While North Korean chemical weapons are a more immediate threat to South Korea, additional bio-defensive measures might serve a similar purpose. There are reports that the South Korean armed forces intend to vaccinate members for anthrax next year. Improving South Korea's disease surveillance capabilities serves a public health benefit by helping to detect any future outbreak of a SARS (severe acute respiratory syndrome) or MERS (Middle Eastern respiratory syndrome)-like epidemic or a biological weapons attack. The United States and South Korea have cooperated on the deployment of the Joint United States–Korea Portal and Integrated Threat Recognition (JUPITR) program, which provides a biosurveillance capability that speeds up the detection of biological threats from days to hours.<sup>32</sup> The deployment of this system or some other biosurveillance system has a potentially important dual-use benefit.

### Call for a No-First-Use of CBW Pledge on the Peninsula

South Korea, the United States, other members of the Six-Party Talks, or the UN Security Council should call for a pledge of no-first-use of CBW on the Peninsula. Since South Korea is a member of both the Chemical and Biological Weapons Conventions, and does not have offensive chemical or biological weapons programs, a pledge of no-first-use is a benefit for South Korea without any military downside. Since North Korea has publicly stated that it is a member of the Biological Weapons Convention when challenged about its biological weapons capabilities and asserted that it “does not develop, produce and stockpile chemical weapons

and opposes chemical weapons themselves”, there is at least some acknowledgement that these are taboo weapons.<sup>33</sup> Until there is greater transparency on the Kim regime’s dual-use facilities, its claims will be suspect. Nonetheless, highlighting concerns about CBW on the Peninsula and how they would complicate a potential conflict may encourage restraint on the part of North Korea. Finally, while North Korea’s nuclear and missile programs are its most threatening military capabilities and warrant enduring international pressure for restraint, shifting some of the focus to other military capabilities may provide an opportunity for some arms control dialogue.

North Korea may not be willing to engage in any dialogue about its actual or latent CBW any more than it has with its nuclear and ballistic missile capabilities. However, there is a broader international audience to underscore the taboo on CBW production and use. The taboo on the production and use of chemical weapons has eroded considerably in the Middle East following the Iran–Iraq war in the 1980s, Iraqi use against the Kurds in the 1990s, and Syrian use against regime opponents in the past five years. Introducing the idea of a no-first-use of CBW pledge on the Korean Peninsula may start a process that leads to greater restraint and some transparency. The taboo can extend beyond production and use to also include transfer to third parties.

## Conclusion

North Korea’s actual and latent CBW capabilities are an underexamined and imperfectly understood factor in the military tinderbox on the Peninsula. In contrast to the ways the Kim regime has highlighted its nuclear and ballistic missile capabilities, it has largely shrouded its chemical and biological capabilities in secrecy. Its chemical weapons capabilities are the higher priority threat as they are easier to produce in volume than biological weapons, and the regime has never embraced the CWC. The regime’s biological weapons capabilities are less understood, are less

certain to be effective during warfighting, and are probably less developed. Moreover, the regime has at least joined the BWC by accession, although its credibility in adhering to agreements does not inspire confidence. Both weapons capabilities warrant enduring vigilance, as North Korea has proven that it can surprise the international community with rapid advances in its military capabilities. **PRISM**

## Notes

<sup>1</sup> Office of the Secretary of Defense, Nuclear Posture Review, February 2018, 33, available at <<https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>>.

<sup>2</sup> International Crisis Group, “North Korea’s Chemical and Biological Weapons Programs,” *Asia Report*, No. 167, June 18, 2009, available at <<https://www.crisisgroup.org/asia/north-east-asia/korean-peninsula/north-korea-s-chemical-and-biological-weapons-programs>>.

<sup>3</sup> For an excellent review of issues associated with the sourcing on North Korea’s chemical and biological weapons programs see, Elisa D. Harris, “Threat Reduction and North Korea’s CBW Programs,” *The Nonproliferation Review*, Fall–Winter 2004. See also, Sonia Ben Ouagrham-Gormley, “Potemkin or real? North Korea’s biological weapons program,” *Bulletin of the Atomic Scientists*, January 11, 2018, available at <<https://thebulletin.org/potemkin-or-real-north-korea-s-biological-weapons-program10957>>.

<sup>4</sup> International Crisis Group, 2009; See also Joseph S. Bermudez, Jr., “North Korea’s Chemical Warfare Capabilities,” 38 *North*, October 10, 2013, available at <<http://www.38north.org/2013/10/jbermudez101013>>; and Kyle Mizokami, “Everything You Need to Know: North Korea’s Chemical Weapons Are No Joke,” *National Interest*, August 10, 2017, available at <<http://nationalinterest.org/blog/the-buzz/everything-you-need-know-north-koreas-chemical-weapons-are-21849>>.

<sup>5</sup> Gordon M. Burke and Charles C. Flowerree, *International Handbook on Chemical Weapons Proliferation*, (Westport, CT: Greenwood Press), 1991.

<sup>6</sup> International Crisis Group, “North Korea’s Chemical and Biological Weapons Programs,” *Asia Report*, No. 167, June 18, 2009, p., 8, available at <<https://www.crisisgroup.org/asia/north-east-asia/korean-peninsula/north-korea-s-chemical-and-biological-weapons-programs>>. See also, Kyle Mizokami, “Everything You Need to Know: North Korea’s

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<sup>7</sup> For an account of how the attack was likely conducted, see Doug Bock Clark, “The Untold Story of Kim Jong-nam’s Assassination,” *GQ*, September 25, 2017, available at <<https://www.gq.com/story/kim-jong-nam-accidental-assassination>>.

<sup>8</sup> Nick Holdsworth and Robert Mendick, “Prime Suspect in Georgi Markov ‘umbrella poison’ murder tracked down to Austria,” *The Telegraph*, March 23, 2013, available at <<http://www.telegraph.co.uk/news/uknews/crime/9949856/Prime-suspect-in-Georgi-Markov-umbrella-poison-murder-tracked-down-to-Austria.html>>. For another example see, Griff Witte and Michael Birnbaum, “Putin implicated in fatal poisoning of former KGB officer at London hotel,” *Washington Post*, January 21, 2016, available at <[https://www.washingtonpost.com/world/putin-implicated-in-fatal-poisoning-of-former-kgb-spy-at-posh-london-hotel/2016/01/21/2c0c5052-bf92-11e5-98c8-7fab78677d51\\_story.html?utm\\_term=.add9ddee625](https://www.washingtonpost.com/world/putin-implicated-in-fatal-poisoning-of-former-kgb-spy-at-posh-london-hotel/2016/01/21/2c0c5052-bf92-11e5-98c8-7fab78677d51_story.html?utm_term=.add9ddee625)>.

<sup>9</sup> Ministry of National Defense, Republic of Korea, “2012 Defense White Paper,” (December 2012), 36, available at <[https://www.nti.org/media/pdfs/ROK\\_2012\\_White\\_Paper.pdf](https://www.nti.org/media/pdfs/ROK_2012_White_Paper.pdf)>.

<sup>10</sup> Ministry of National Defense, Republic of Korea, “2016 Defense White Paper,” 34, available at <[http://www.mnd.go.kr/user/mndEN/upload/pblicitn/PBLICTNEBOOK\\_201705180357180050.pdf](http://www.mnd.go.kr/user/mndEN/upload/pblicitn/PBLICTNEBOOK_201705180357180050.pdf)>.

<sup>11</sup> Elisa D. Harris, “Threat Reduction and North Korea’s CBW Programs, *The Nonproliferation Review*, (Fall–Winter 2004), 91.

<sup>12</sup> Bruce Bennett, “The Challenge of North Korean Biological Weapons,” testimony presented before the House of Representatives Armed Services Committee on Intelligence, Emerging Threats and Capabilities, October 11, 2013, available at <<https://www.rand.org/pubs/testimonies/CT401.html>>. See also Bermudez, 2013.

<sup>13</sup> Elisa D. Harris, “Threat Reduction and North Korea’s CBW Programs, *The Nonproliferation Review*, (Fall–Winter 2004), 90.

<sup>14</sup> Sofia Lotto Persio, “North Korean Soldier had ‘Anthrax Antibodies,’ Raising Concerns Over Pyongyang’s Biological Weapons Plans,” *Newsweek*, December 12, 2017, available at <<http://www.newsweek.com/north-korean-soldier-who-defected-may-have-been-vaccinated-against-anthrax-759919>>. See also, Patrick Knox, “War and Pestilence: Defected North Korean soldier ‘vaccinated’ against Anthrax amid fears Kim Jong-un plans to use bio-Weapons to spread

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<sup>15</sup> Sara Reardon, “US Military Accidentally Ships Live Anthrax to Labs, *Nature*, May 28, 2015, available at <<https://media.defense.gov/2018/Feb/02/2001872886/-1/-1/1/2018-NUCLEAR-POSTURE-REVIEW-FINAL-REPORT.PDF>>. See also, Patrick Tucker, “This is Why The Army Sent Anthrax to South Korea, Australia, and 11 States, *Defense One*, May 29, 2015, available at <<http://www.defenseone.com/technology/2015/05/why-army-sent-anthrax-south-korea/114094/>>; Barbara Starr, “Army may have shipped live anthrax to Australia, *CNN*, May 29, 2015, available at <<https://www.cnn.com/2015/05/27/politics/live-anthrax-us-military-sent-inadvertently/index.html>>.

<sup>16</sup> Melissa Hanham, “Kim Jong Un Tours Pesticide Facility Capable of Producing Biological Weapons: A 38 North Special Report,” 38 North, (July 9, 2015), available at <<http://www.38north.org/2015/07/mhanham070915>>.

<sup>17</sup> Central Intelligence Agency, “Report of Proliferation-Related Acquisition in 1997,” last updated June 19, 2013, available at <<https://www.cia.gov/library/reports/general-reports-1/report-of-proliferation-related-acquisition-in-1997.html#North-Korea>>.

<sup>18</sup> Porter J. Goss, “Global Intelligence Challenges 2005: Meeting Long-Term Challenges with a Long-Term Strategy,” (February 16, 2005), available at <[https://www.cia.gov/news-information/speeches-testimony/2005/Goss\\_testimony\\_02162005.html](https://www.cia.gov/news-information/speeches-testimony/2005/Goss_testimony_02162005.html)>.

<sup>19</sup> James R. Clapper, “Statement for the Record: U.S. Intelligence Community Worldwide Threat Assessment,” January 29, 2014, available at <[https://www.dni.gov/files/documents/Intelligence%20Reports/2014%20WWTa%20%20SFR\\_SSCI\\_29\\_Jan.pdf](https://www.dni.gov/files/documents/Intelligence%20Reports/2014%20WWTa%20%20SFR_SSCI_29_Jan.pdf)>.

<sup>20</sup> James R. Clapper, “Statement for the Record: US Intelligence Community Worldwide Threat Assessment,” February 26, 2015, available at <[https://www.dni.gov/files/documents/Unclassified\\_2015\\_ATA\\_SFR\\_-\\_SASC\\_FINAL.pdf](https://www.dni.gov/files/documents/Unclassified_2015_ATA_SFR_-_SASC_FINAL.pdf)>.

<sup>21</sup> Daniel R. Coats, “Statement for the Record: US Intelligence Community Worldwide Threat Assessment,” May 11, 2017, available at <<https://www.dni.gov/index.php/newsroom/congressional-testimonies/item/1757-statement-for-the-record-worldwide-threat-assessment-of-the-u-s-intelligence-community-before-the-ssci>>.

<sup>22</sup> Bruce E. Bechtol Jr., “North Korea and Syria: Partners in Destruction and Violence,” *The Korean Journal of Defense Analysis*, vol. 27, no. 3 (September 2015), 277–92.

<sup>23</sup> David Makovsky, “The Silent Strike: How Israel bombed a Syrian nuclear installation and kept it

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